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Evidence Suggesting That a Chronic Disease Self-Management Program Can Improve Health Status While Reducing Hospitalization

A Randomized Trial

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OBJECTIVES. **This study evaluated the effectiveness (changes in health behaviors, health status, and health service utilization) of a self-management program for chronic disease designed for use with a heterogeneous group of chronic disease patients. It also explored the differential effectiveness of the intervention for subjects with specific diseases and comorbidities.**

METHODS. **The study was a six-month randomized, controlled trial at community-based sites comparing treatment subjects with wait-list control subjects. Participants were 952 patients 40 years of age or older with a physician-confirmed diagnosis of heart disease, lung disease, stroke, or arthritis. Health behaviors, health status, and health service utilization, as determined by mailed, self-administered questionnaires, were measured.**

RESULTS. **Treatment subjects, when compared with control subjects, demonstrated improvements at 6 months in weekly minutes of exercise, frequency of cognitive symptom management, communication with physicians, self-reported health, health distress, fatigue, disability, and social/role activities limitations. They also had fewer hospitalizations and days in the hospital. No differences were found in pain/physical discomfort, shortness of breath, or psychological well-being.**

CONCLUSIONS. **An intervention designed specifically to meet the needs of a heterogeneous group of chronic disease patients, including those with comorbid conditions, was feasible and beneficial beyond usual care in terms of improved health behaviors and health status. It also resulted in fewer hospitalizations and days of hospitalization.**

Key words: chronic disease; self-management; patient education; cost; utilization. (Med Care 1999;37:5–14)

As the average age of our population increases, so does the prevalence of chronic disease. It is now estimated that people aged 60 years and older have, on average, 2.2 chronic conditions.[1] Chronic disease is responsible for almost 70% of health care expenditures.[2]

There are many examples of how patient education programs for specific chronic conditions have increased healthful behaviors, improved health status, and/or decreased health care costs of their participants. An excellent bibliography of more than 400 such patient education studies has

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been published recently.[3] To date, few of the studies have dealt with more than one disease or with the problems of comorbidity. Rather, each patient education intervention has been disease-specific.

With the emergence of chronic disease as the largest threat to health status and the largest cause of health care expenditures, the potential role of patient self-management assumes increased importance. If benefits can be shown from an inexpensive, replicable self-management program, such programs might be a useful part of a therapeutic regime. Our study explored this possibility. It differed from previous self-management studies in that it: (1) placed subjects with different chronic diseases and different combinations of comorbid diseases in the same program at the same time; (2) utilized a randomized, controlled design; and (3) measured outcomes in terms of behaviors, health status, and health service utilization. Although former patient self-management education studies had one or more of these attributes, none have had all three.

The objectives of the study were to evaluate the effectiveness (changes in health behaviors, health status, and health service utilization) of a self-management program for chronic disease designed for use with a heterogeneous group of chronic disease patients and to explore the differential effectiveness of the intervention for subjects with specific diseases and comorbidities. The experience during 6 months with the 952 patients with heart disease, lung disease, stroke, or arthritis is reported here.

Methods

The Chronic Disease Self-Management Program (CDSMP) is a community-based patient self-management education course. Three principal assumptions underlie the CDSMP: (1) patients with different chronic diseases have similar self-management problems and disease-related tasks; (2) patients can learn to take responsibility for the day-to-day management of their disease(s); and (3) confident, knowledgeable patients practicing self-management will experience improved health status and will utilize fewer health care resources. Other assumptions that shaped the program were that: (1) patient self-management education should be inexpensive and widely available; (2) trained lay persons with chronic conditions could effectively deliver a structured patient education program; and (3) such lay instructors would be acceptable to both patients and health professionals. There is research evidence that positive role models (in this case, lay leaders with similar backgrounds and disease problems) increase patients' self-efficacy or confidence in their ability to manage their disease.[4]

Needs Assessment

The content and methodology of the CDSMP were based on two needs assessments. The first was a literature review of existing chronic disease patient education programs.[5] The purpose of this review was to identify common topics taught across chronic disease courses. In a review of more than 70 articles, the authors found 12 common tasks: recognizing and acting on symptoms, using medication correctly, managing emergencies, maintaining nutrition and diet, maintaining adequate exercise, giving up smoking, using stress reduction techniques, interacting effectively with health care providers, using community resources, adapting to work, managing relations with significant others, and managing psychological responses to illness.

The second needs assessment sought information from 11 focus groups.[6] Participants included people older than 40 years with chronic diseases. Participants were invited to: (1) describe their disease(s) and what they thought caused them; (2) explain their feelings and beliefs about getting older; (3) describe the physical, social, and emotional impacts of chronic disease on their lives and the lives of their families; (4) describe how they coped with the problems caused by their disease(s); and (5) elaborate on their fears, hopes, and wishes for the future. Theme analysis from these groups' responses was used to shape both the content of the CDSMP and the process of instruction.

Chronic Disease Self-Management Program Design

The topics covered in the CDSMP included: exercise; use of cognitive symptom management techniques; nutrition; fatigue and sleep management; use of community resources; use of medications; dealing with the emotions of fear, anger, and depression; communication with others including health professionals; problem-solving; and decision-making. The content of the course

has been published as Living a Healthy Life with Chronic Conditions.[7] This book was used as a text for course participants.

The process of teaching the course is based on Self-Efficacy Theory. It incorporates strategies suggested by Bandura to enhance self-efficacy.[8] These include weekly action planning and feedback, modeling of behaviors and problem-solving by participants for one another, reinterpretation of symptoms by giving many possible causes for each symptom as well as several different management techniques, group problem-solving, and individual decision-making. The leaders act more as facilitators than as lecturers. For example, rather than prescribing specific behavior changes, they assist participants in making management choices and achieving success in reaching self-selected goals. The process is documented in a detailed protocol, Chronic Disease Self-Management Leader's Manual.[9]

Each course had 10 to 15 participants of mixed ages and diagnoses, including family members if they wished to attend. Each course was taught by a pair of trained, volunteer lay leaders. The 87 leaders received 20 hours of training with the detailed teaching manual. They ranged in age from 21 to 80 years (82% were older than 40).[9] Seventy-one percent of the leaders had one or more chronic diseases, 23% were health professionals, and 15% were students. Few had previous experience in health education. On average, leaders taught 2.4 courses. The program was given in seven weekly 2.5-hour sessions.

Entry Criteria

To enter the study, subjects had their physician confirm a diagnosis of chronic lung disease (asthma, chronic bronchitis, or emphysema), heart disease (coronary artery disease or congestive heart failure), stroke (completed cerebrovascular accident with neurologic handicap and normal mentation), or chronic arthritis. In addition to at least one of the above conditions, they could have other conditions. Patients with compromised mentation, cancer patients who received chemotherapy or radiation within the past year, and persons younger than 40 years of age were excluded. Subjects' physicians and hospitals were not informed as to their study status (treatment or control).

Recruitment and Randomization

Subjects were recruited using public service announcements in the mass media, referrals from flyers left in physicians' offices and community clinics, posters at senior citizen centers, announcements in health maintenance organization (HMO) patient newsletters, and referrals from county government employers. Before filling out their initial questionnaire and before randomization, all subjects were told they would either receive the course immediately or after serving as a control for 6 months.

To assure that the program would be easily accessible to patients, it was held in multiple community sites in a four county area. Programs were held in churches, senior and community centers, public libraries, and health care facilities. In addition, programs were planned at varied times for the convenience of patients including late mornings, early afternoons, evenings, and Saturday mornings. The project was approved by the institutional Committee for the Protection of Human Subjects in Research. All participants gave written informed consent. After each subject's physician(s) had supplied a diagnosis and after each subject had completed a consent form and baseline questionnaire, participants were randomized to treatment or control status. Randomization was conducted serially. After all subjects had applied to a specific site, typically 16 to 30 subjects, the randomization ratio (treatment versus controls) was determined so as to assure no fewer than 10 and no more than 15 treatment subjects. Thus, in some sites the ratio of treatment-to-control subjects was 4:6, whereas in others it was 7:3. This randomization method resulted in an overall 6:4 ratio.

Outcome Measures

There were three primary classifications of outcome variables: health behaviors, health status, and health service utilization. Data were collected by previously tested self-administered, mailed questionnaires. To minimize acquiescent response, data collection was completely separate from the intervention and carried out by persons who did not know the subjects or their treatment status. Measures included the self-rated health scale used in the National Health Interview Survey and a modified version of the Health Assessment Questionnaire (HAQ) disability scale.[10,11] The psychological

well-being scale, also known as the MHI-5, which is part of the SF-36, as well as the SF-20, was used.[12,13] The pain and physical discomfort scale was an adaptation of the Medical Outcomes Study (MOS) pain scale; it was modified to include physical discomfort.[14] The energy/fatigue scale was the scale used in the long-form MOS, and the health distress scale was a slightly modified version of the MOS health distress scale.[15] The remaining measures (ie, duration of exercise, use of cognitive symptom management, communication with physicians, social/role activity limitations, shortness of breath, and utilization measures) were developed and tested for this study. Definitions of all measures and information on their reliability and validity are presented elsewhere.[6] The magnitude of the correlations among the health status scales ranged from 0.14 to 0.60 (median, 0.43). The highest correlation was between psychological well-being and health distress (0.60).

Subjects were assessed for three types of health utilization: visits to physicians, including visits to the emergency room (ER), visits to hospitals during the past 6 months, and the number of nights spent in a hospital. For each category, they reported how often they used these health services. The self-reported data for 200 subjects who were HMO members were validated against automated medical records. Outpatient self-reported visits were associated with the medical record visits ($r = 0.64$) and ER visits ($r = 0.60$). We found that patients often included urgent care and after-hour visits with ER visits instead of counting these as outpatient visits. Thus, the data for all subjects' ER visits were combined with data for outpatient physician visits. When combined, the self-reported data for outpatient visits correlated ($r = 0.70$) with medical records. We found errors made both by patients and by the automated record system. Patients tended to underreport recorded visits by approximately 17%. Conversely, the system sometimes overreported visits. For example, a subject who received numerous allergy injections from a nurse was reported by the system to have had a physician visit for each injection. For days in hospital, medical records correlated with patient self-report ($r = 0.83$).

Analyses

The primary analysis compared 6-month outcomes between the treatment and control groups on each outcome variable using analysis of covariance on endpoint scores, controlling for the baseline value of the study variable, as well as age, sex, education, and marital status. The endpoint data were examined by analysis of covariance for variation among the 108 CDSM programs in which participants were taught; between-program variation in effects was found to be minimal and did not influence overall conclusions. Therefore, treatment and control data were aggregated across programs of instruction.

The secondary analyses determined if the intervention had different outcomes for those with different diseases. Two-way analyses of variance were utilized, testing for the interaction of disease by treatment status (treatment/control).

Results

Primary Results

Of the 1,140 subjects who entered the study (ie, were randomized to treatment [n = 664] or to control status [n = 476]), 952 [83%] completed the 6-month study. Of the treatment subjects, 84% completed 6 months compared with 82% of the control subjects. Treatment subjects completing 6-month data attended an average of 5.5 of the seven program sessions. Of those treatment subjects not completing 6-month data, 1.2% had died, 3.4% were too ill to continue, and 11.4% had unknown reasons. For the control subjects, the respective percentages were 0.81, 7.8, and 9.4. Comparing baseline data for subjects who completed 6-month data with those who did not, the noncompleters had significantly fewer minutes of aerobic exercise per week and higher levels of activity limitation, pain/physical discomfort, fatigue, and health distress than did those who completed the 6 months ($P < 0.05$); however, there were no statistically significant differences between the treatment and control subjects at study entry on any variable. Table 1 presents the demographic and disease characteristics of study participants completing the study. Only marital status was significantly different ($P < 0.05$). Table 2 gives baseline data and mean 6-month uncorrected change scores for the CDSMP treatment subjects and the control subjects. As compared with controls, the treatment group demonstrated significant improvement in all four health behavior variables ($P < 0.01$; number of minutes per week of stretching/strengthening and aerobic exercise; in-

TABLE 1. Subject Characteristics

	Treatment (n = 561)	Control (n = 391)
Mean age (years)	65.6	65.0
Age range	40–90	40–89
Median/Mode	65.5/71	65.5/71
% Female	65	64
Mean education (years)	15	15
% ≤ 12 yrs	27	27
% 13–15 yrs	28	25
% 16 yrs	16	21
% > 16 yrs	29	27
% Married	54.1	59.1*
% White	91.4	88.8
Diseases		
% Heart disease	31	35
% Lung disease	46	43
% Arthritis	56	53
% Stroke	10	12
Mean number diseases	2.2	2.3
Provider		
% Covered by HMO	57	55
% Private fee for service	35	35
% Govt. only (Medicare, Medical, and CHAMPUS VA)	8	10

*χ^2. $P < 005$.

creased practice of cognitive symptom management; and improved communication with their physician). They also demonstrated significant improvement in five of the health status variables (self-rated health, disability, social/role activities limitation, energy/fatigue, and health distress; $P < 0.02$). No significant differences were demonstrated for pain and physical discomfort, shortness of breath, or for psychological well-being. The treatment group, as compared with the control group, had fewer hospitalizations ($P < 0.05$) and spent, on average, 0.8 fewer nights in the hospital ($P = 0.01$). There were no significant differences in visits to physicians ($P = 0.11$).

An intent to treat analysis also was conducted that included 1,128 subjects. Baseline (entry) data were used at 6 months for the 176 subjects (drop outs) who did not complete 6-month data. (The eight treatment and four control subjects who died were excluded.) In this analysis, all probability values remained unchanged, although the change scores were reduced slightly for both the treatment and control groups. For example, the changes in communication with physicians were 0.22 for treatment subjects compared with 0.09 for controls, health distress was -0.20 for the treatment subjects compared with -0.06 for controls, and nights in hospital was -0.22 for treatment subjects compared with 0.46 for controls.

Of the 391 control subjects who completed the 6-month randomized study, 283 (72%) chose to take the CDSMP. Of these, 237 provided 6-month post-CDSMP endpoint data. Using matched pair *t* tests comparing data before starting the CDSMP and 6 months after starting the program, this group increased their aerobic exercise and use of coping strategies ($P < 0.05$). They also decreased their disability and health distress while increasing their social and role activities ($P < 0.05$). Visits to physicians decreased by 0.98 ($P < 0.05$). The group had fewer visits to hospitals and 0.65 fewer days in hospital ($P < 0.05$). Changes in other study variables listed in Table 2 were not significant, although all demonstrated a trend toward improvement. Thus, it appears that by taking the CDSMP, control subjects reversed many of the trends toward worsening health demonstrated during the 6-month randomized trial.

Secondary Results

Tables 3 and 4 present baseline data and 6-month change scores for treatment and control subjects in the various disease categories: those whose only disease was arthritis, heart disease, or lung disease, and those with comorbidities. Subjects who only had a stroke were not included in this analysis because of small numbers. A two-way analysis of covariance, controlling for baseline status, examined main treatment effects and interactions among the four disease categories and found no significant interactions for any of the 20 outcome variables. Examination of the 6-month change scores confirmed the tendency for the change scores to reflect program effects similarly across all four diagnostic subgroups.

Program costs versus savings also were examined. Although the treatment group reduced their visits to physicians slightly more than did the control group, the difference was not significant. The decrease in the number of hospitalizations and in the number of nights of hospitalization were significant ($P < 0.05$, Table 2). Assuming a

TABLE 2. Baseline and Six-Month Changes for Treatment and Control Subjects: Health Behaviors, Health Status, and Health Service Utilization

	Baseline		Six-Month Change		
	Treatment Mean (SD) (n = 561)	Control Mean (SD) (n = 391)	Treatment Mean (SD of Δ)	Control Mean (SD of Δ)	Significance *P**
Health behaviors					
Stretching & strengthening	40	37	13	5	0.005
Exercise (minutes/week)	(54)	(54)	(56.7)	(54.6)	
Aerobic exercise	95	93	16	-2	0.0003
(minutes/week)	(97)	(83)	(94.5)	(87.0)	
Cognitive symptom	1.3	1.3	0.38	.07	0.0001
Mgmt. (0–5, ↑ = better)	(0.88)	(0.94)	(0.77)	(0.73)	
Communication w/MD	3.0	3.0	0.26	.11	0.006
(0–5, ↑ = better)	(1.2)	(1.2)	(0.98)	(0.96)	
Health status					
Self-rated health	3.4	3.3	-0.09	0.02	0.02
(1–5, ↓ = better)	(0.88)	(0.93)	(0.72)	(0.69)	
Disability	0.78	0.85	-0.02	.03	0.002
(0–3, ↓ = better)	(0.59)	(0.63)	(0.32)	(0.36)	
Social/Role activities	1.8	1.8	-0.07	.08	0.0007
Limitations (0–4, ↓ = better)	(1.1)	(1.1)	(0.92)	(0.87)	
Pain/Physical discomfort	58	59	-2.6	-2.2	0.27
(0–100, ↓ = better)	(22.6)	(23.6)	(19.4)	(17.6)	
Psychological well-being	3.4	3.4	0.09	0.04	0.10
(0–5, ↑ = better)	(0.88)	(0.98)	(0.69)	(0.67)	
Energy/Fatigue	2.2	2.2	0.14	0.02	0.003
(0–5, ↑ = better)	(1.1)	(1.1)	(0.79)	(0.75)	
Health distress	2.1	2.1	-0.24	-0.07	0.001
(0–5, ↓ = better)	(1.2)	(1.2)	(0.98)	(0.97)	
Shortness of breath	1.3	1.4	0.02	-0.02	0.56
(0–4, ↓ = better)	(1.1)	(1.2)	(0.87)	(0.78)	
Health service utilization					
MD & ER visits	6.1	6.4	-0.77	-0.54	0.11
(times past 6 months)	(5.7)	(6.1)	(5.6)	(6.3)	
Number of hospital stays	0.24	0.30	-0.07	-0.05	0.047
(past 6 months)	(0.69)	(0.98)	(0.69)	(1.1)	
Nights in hospital	1.1	1.0	-0.28	0.56	0.01
(past 6 months)	(4.1)	(4.1)	(5.2)	(7.0)	

*Analysis of covariance on 6 month post-test scores controlling for treatment status, age, sex, education, marital status, and baseline status.
(Two-tailed *P* values.)

cost of $1,000 per day of hospitalization, the 6-month health care costs for each control participant in this study were $820 greater than for each treatment subject. The costs of providing the program for treatment subjects who completed the 6-month study were calculated to be $70 per participant. This includes $26 for training leaders (assuming two leaders teach each course and that

TABLE 3. Baseline Scores for Treatment and Control Subjects By Disease: Health Behaviors, Health Status, and Health Service Utilization

	Arthritis Only		Heart Disease Only		Lung Disease Only		Comorbid Conditions	
	Treatment Mean (SD) (n = 86)	Control Mean (SD) (n = 62)	Treatment Mean (SD) (n = 45)	Control Mean (SD) (n = 31)	Treatment Mean (SD) (n = 107)	Control Mean (SD) (n = 60)	Treatment Mean (SD) (n = 311)	Control Mean (SD) (n = 225)
Health behaviors								
Stretching/Strengthening	42.4	48.8	47	25.2	30.4	23.8	39.9	37.1
Exercise (minutes/week)	(56.6)	(62.9)	(61.1)	(36.2)	(50.7)	(45.0)	(52.4)	(53.4)
Aerobic exercise	107.4	89.5	122.3	126.8	80.2	67.5	89.1	94.5
(minutes/week)	(103.4)	(85.2)	(104.2)	(80.0)	(91.2)	(72.0)	(91.5)	(81.6)
Cognitive symptom	1.2	1.6	1.3	1.2	1.3	1.1	1.4	1.2
Mgmt. (0–5, ↑ = better)	(0.88)	(1.1)	(0.78)	(0.96)	(0.91)	(0.82)	(0.88)	(0.91)
Communication with MD	3.0	3.0	2.9	3.0	2.9	2.8	3.1	3.1
(0–5, ↑ = better)	(1.2)	(1.2)	(1.1)	(1.0)	(1.2)	(1.2)	(1.2)	(1.2)
Health status								
Self-rated health	3.1	3.0	3.2	3.2	3.3	3.4	3.5	3.4
(1–5, ↓ = better)	(0.91)	(1.0)	(6.3)	(0.87)	(0.90)	(0.89)	(0.88)	(0.91)
Disability	0.98	0.90	0.24	0.34	0.57	0.63	0.87	0.94
(0–3, ↓ = better)	(0.63)	(0.55)	(0.37)	(0.46)	(0.48)	(0.55)	(0.57)	(0.61)
Social/Role activities	1.8	1.9	1.1	1.0	1.8	1.6	1.9	1.9
Limitations (0–4, ↓ = better)	(1.0)	(1.2)	(1.0)	(1.1)	(1.1)	(1.1)	(1.1)	(1.1)
Pain/Physical discomfort	68.6	70.3	40.9	40.2	50.4	50.6	60.8	61.5
(0–100, ↓ = better)	(18.7)	(17.8)	(18.5)	(22.0)	(19.2)	(23.6)	(22.7)	(22.8)
Psychological well-being	3.5	3.5	3.3	3.5	3.5	3.5	3.4	3.3
(0–5, ↑ = better)	(0.92)	(0.90)	(0.90)	(0.78)	(0.89)	(0.90)	(0.87)	(1.05)
Energy/Fatigue	2.1	2.4	2.6	2.6	2.3	2.3	2.1	2.0
(0–5, ↑ = better)	(1.2)	(1.1)	(1.0)	(1.1)	(1.1)	(1.0)	(1.0)	(1.1)
Health distress	2.1	2.0	1.7	1.9	2.0	2.0	2.2	2.2
(0–5, ↓ = better)	(1.2)	(1.2)	(1.1)	(1.2)	(1.1)	(1.1)	(1.1)	(1.2)
Shortness of breath	0.48	0.37	0.94	1.0	2.2	2.3	1.3	1.6
(0–4, ↓ = better)	(0.69)	(0.73)	(0.94)	(0.97)	(0.94)	(0.97)	(1.1)	(1.2)
Health service utilization								
MD and ER visits	4.97	5.37	5.02	5.00	5.98	5.95	6.51	7.08
(times past 6 months)	(4.32)	(5.61)	(4.51)	(3.49)	(5.68)	(4.63)	(6.12)	(6.82)
Number of hospital stays	0.14	0.13	0.42	0.52	0.19	0.28	0.26	0.31
(past 6 months)	(0.47)	(0.38)	(0.84)	(0.85)	(5.2)	(1.1)	(0.75)	(1.1)
Nights in hospital	0.66	0.13	1.2	1.5	0.69	1.3	1.3	1.0
(past 6 months)	(0.26)	(0.38)	(2.9)	(3.6)	(2.3)	(7.2)	(4.9)	(3.1)

TABLE 4. Six-Month Changes for Treatment and Control Subjects By Disease: Health Behaviors, Health Status, and Health Service Utilization

	Arthritis Only		Heart Disease Only		Lung Disease Only		Comorbid Conditions	
	Treatment Mean Δ (SD)	Control Mean Δ (SD)	Treatment Mean Δ (SD)	Control Mean Δ (SD)	Treatment Mean Δ (SD)	Control Mean Δ (SD)	Treatment Mean Δ (SD)	Control Mean Δ (SD)
Health behaviors								
Stretching/Strengthening	16.4	5.3	5.7	2.9	10.9	10.3	13.2	3.3
Exercise (minutes/week)	(60.5)	(55.5)	(47.6)	(51.4)	(46.1)	(56.2)	(60.6)	(52.2)
Aerobic exercise	24.1	11.4	3.3	-21.3	21.9	11.1	12.7	-6.5
(minutes/week)	(120.9)	(96.8)	(92.8)	(67.8)	(85.4)	(82.5)	(89.3)	(86.5)
Cognitive symptom	0.57	0.03	0.29	-0.01	0.33	0.17	0.35	0.07
Mgmt. (0–5, ↑ = better)	(0.81)	(0.64)	(0.85)	(0.91)	(0.81)	(0.73)	(0.73)	(0.74)
Communication w/MD	0.34	-0.03	0.30	0.19	0.26	0.26	0.24	0.10
(0–5, ↑ = better)	(1.2)	(1.1)	(1.2)	(0.79)	(0.89)	(0.89)	(0.91)	(0.91)
Health status								
Self-reported health	-0.08	0.02	-0.20	-0.06	-0.11	0.08	-0.08	0.04
(1–5, ↓ = better)	(0.80)	(0.67)	(0.59)	(0.63)	(0.83)	(0.56)	(0.68)	(0.73)
Disability	-0.05	0.00	0.06	0.10	-0.04	0.09	-0.01	0.02
(0–3, ↓ = better)	(0.38)	(0.42)	(0.35)	(0.34)	(0.29)	(0.33)	(0.30)	(0.34)
Social/Role activities	-0.13	-0.13	-0.15	0.19	-0.17	0.22	0.01	0.08
Limitations (0–4, ↓ = better)	(0.97)	(0.78)	(0.93)	(0.87)	(1.0)	(0.85)	(0.86)	(0.89)
Pain/Physical discomfort	-5.4	-7.5	-4.8	2.7	-4.3	-3.4	-1.0	-0.89
(0–100, ↓ = better)	(15.9)	(15.2)	(17.0)	(18.5)	(20.7)	(20.5)	(20.1)	(17.1)
Psychological well-being	0.08	0.09	0.36	-0.04	0.05	0.07	0.07	0.03
(0–5, ↑ = better)	(0.73)	(0.60)	(0.76)	(0.66)	(0.70)	(0.68)	(0.67)	(0.69)
Energy/Fatigue	0.31	-0.04	0.22	-0.08	0.1	0.13	0.08	0.02
(0–5, ↑ = better)	(0.82)	(0.74)	(0.74)	(0.95)	(0.92)	(0.66)	(0.73)	(0.75)
Health distress	-0.30	-0.27	-0.20	0.04	-0.26	0.01	-0.23	-0.07
(0–5, ↓ = better)	(1.1)	(0.96)	(0.84)	(0.70)	(0.92)	(0.76)	(0.97)	(1.1)
Shortness of breath	0.12	0.00	0.06	0.11	-0.18	-0.19	0.04	-0.02
(0–4, ↓ = better)	(0.59)	(0.57)	(0.87)	(0.78)	(0.93)	(0.77)	(0.91)	(0.83)
Health service utilization								
MD & ER visits	-0.67	-1.69	-0.89	-0.52	-1.44	-0.17	-0.55	-0.21
(times past 6 months)	(4.14)	(5.51)	(3.82)	(3.45)	(5.77)	(5.04)	(6.10)	(7.24)
Number of hospital stays	-0.04	-0.03	-0.20	-0.23	-0.04	-0.15	-0.07	0.02
(past 6 months)	(0.57)	(0.48)	(0.63)	(0.76)	(0.68)	(1.2)	(0.73)	(1.2)
Nights in hospital	-0.44	0.21	-0.60	-0.71	0.19	0.23	-0.25	1.1
(past 6 months)	(2.8)	(1.9)	(2.5)	(3.4)	(3.4)	(11.0)	(6.3)	(6.8)

each leader teaches only one course), $14 for volunteer leader stipend (assuming $100 per leader per course of 15 participants), $15 for course materials (book and audio tape), and $15 administrative costs. This analysis does not take into account the cost of space (which was donated for this study) or indirect costs. Assuming that these figures reflect current costs, the health care expenditure savings (savings in hospital nights minus program costs) approximated $750 per participant, more than 10 times the cost of the intervention.

Discussion

This study was an evaluation of a self-management education intervention for persons with one or more different conditions. The format of the intervention had the attributes of medium-sized classes, lay leaders, and heterogeneity of participants in terms of type and severity of disease(s). Overall, the intervention was successful in increasing healthful behaviors, maintaining or improving health status, and decreasing rates of hospitalization (Table 2). These results indicate that it is possible to educate patients with different chronic diseases successfully in the same intervention at the same time. Because most chronic disease patient education programs have not been formally evaluated, it is difficult to determine if heterogeneous educational interventions such as the CDSMP are more or less effective than homogeneous, single disease-oriented programs. Because people 60 years of age and older have, on average, two or more chronic conditions, it would seem that a program focused on the problems common to the various comorbidities would be a reasonable substitute for, or adjunct to, the more traditional single disease programs.

One key question concerns the generalizability of the findings. As in nearly all such studies, the subjects self-selected to be in the study and may have been more motivated than most chronic disease patients. From past arthritis self-management studies, we have evidence that when patients in a closed HMO rheumatology practice were repeatedly offered an opportunity to participate in an intervention similar to the CDSMP, 47% chose to do so.[16] Men and non-English speakers were less likely to attend. Glascow and Litzelman[17,18] have found similar participation in a diabetes self-management intervention. Studies now being conducted with the Kaiser system and with Latinos should offer more information about the generalizability of CDSMP.

The subjects in our study had a high mean level of education. It is noteworthy that approximately 27% of the subjects had 12 years of education or less and 29% had 16 years or more. When education was entered into the analysis as a covariant of outcomes,however, it did not affect them.

Because of the heterogeneous mix of patients, not all patients had the same symptoms, nor did they all need to change the same behaviors. Thus, the results of the primary analysis of specific outcomes may have underestimated somewhat the individual improvements because they contained data from subjects who either did not have a target symptom or who already had achieved acceptable levels on that outcome. Although we do not have a definitive answer about clinical significance, activity limitation, health distress, and disability were all improved. This suggests that the CDSMP affected important physical and mental aspects of participants' lives.

Tables 3 and 4 explore the effectiveness of the intervention for various subsets of patients. Because these are secondary analyses, we cannot draw definitive conclusions from these data. The findings, however, may be helpful in guiding future studies. Although all of the subgroups appear to have made changes in healthful behaviors, these changes varied by group, as might be expected. For example, the group with heart disease reported the most aerobic exercise at baseline (122.3 and 126.8 minutes/week for the treatment and control groups, respectively), the lung disease group reported the least (80.2 and 67.5), and the arthritis group was intermediate (107.4 and 89.5; Table 4). The treatment participants with arthritis and those with lung disease increased their exercise more than the control subjects did (Table 4). The treatment group with heart disease remained the same, and the control group decreased their exercise. Thus, for patients with low baseline activity levels, the intervention increased activity, whereas for patients with relatively high activity level, this level was maintained. The results concerning the practice of cognitive symptom management techniques and communication with their physicians were uniform across all subgroups.

That the intervention had some differential effects on different subsets of patients is not surprising. Although chronic diseases create similar problems, these problems are more or less salient

for an individual patient at different times across diseases. The CDSMP was designed to meet such a challenge by aiding patients to identify their own individual needs and problems and then assisting them to work most intensively in those areas. In addition, it was designed to meet the needs of the many older patients who have more than one chronic condition.

It is important to note that participants in this study were volunteers, recruited largely by word of mouth and by various forms of public announcement. Although their physicians confirmed their diagnoses and knew of their participation, there was no linkage between the CDSMP content and the individual treatment plans. The CDSMP did not alter participants' treatment. Therefore, the benefits that were achieved were additional to those achieved by usual care. Conceivably, integration of a CDSMP with usual care, perhaps at the outset of a chronic disease, would further enhance the benefits.

Conclusion

The Chronic Disease Self-Management Program is a program designed specifically to meet the needs of a heterogeneous group of chronic disease patients, including those with comorbid conditions. The results of this study suggest that such an intervention is feasible, is beneficial beyond usual care in terms of improved health status, and can decrease hospitalization with a potential of substantial savings in health care costs. If replicated in similar studies, a program such as the CDSMP deserves a place in the treatment regime of patients with chronic disease.

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